

What is claimed is:

1. In a method for producing a quartz glass jig comprising processing a quartz glass raw material into a desired shape by a treatment inclusive of fire working, annealing for stress removal, and cleaning treatment to obtain the final product, the method is characterized by that it comprises performing gas phase etching step and gas phase purification step on the surface layer of the quartz glass jig after applying the annealing treatment for stress removal but before the cleaning treatment, wherein the gas phase purification step is carried out continuously after the gas phase etching step.
2. In a method for producing a quartz glass jig comprising processing a quartz glass raw material into a desired shape by a treatment inclusive of fire working, annealing for stress removal, and cleaning treatment to obtain the final product, the method is characterized by that it comprises performing gas phase etching step and gas phase purification step on the surface layer of the quartz jig after applying the annealing treatment for stress removal but before the cleaning treatment, wherein the gas phase purification step is carried out simultaneously with the gas phase etching step.
3. In a method for producing a quartz glass jig comprising processing a quartz glass raw material into a desired shape by a treatment inclusive of fire working, annealing for stress removal, and cleaning treatment to obtain the final product, the method is characterized by that it comprises performing gas phase etching step

and gas phase purification step on the surface layer of the quartz glass jig simultaneously with the annealing treatment for stress removal, wherein the gas phase purification step is carried out continuously after the gas phase etching step.

- 5 4. In a method for producing a quartz glass jig comprising processing a quartz glass raw material into a desired shape by a treatment inclusive of fire working, annealing for stress removal, and cleaning treatment to obtain the final product, the method is characterized by that it comprises performing gas phase etching step and gas phase purification step on the surface layer of the quartz glass jig simultaneously with the annealing treatment for stress removal, wherein the gas phase purification step is carried out continuously after the gas phase etching step.
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5. A method for producing a quartz glass jig as claimed in one of Claims 1 to 4, wherein the gas phase etching step is performed in the temperature range of from 0 °C to 1300 °C in a gaseous atmosphere containing fluorine (F).
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6. A method for producing a quartz glass jig as claimed in Claim 5, wherein the gas containing F is at least one type selected from the group consisting of C_xF_y , Cl_xF_y , N_xF_y , Si_xF_y , S_xF_y (where, $10 \geq x \geq 1$ and $10 \geq y \geq 1$), CHF_3 , HF, and F_2 .
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7. A method for producing a quartz glass jig as claimed in one of Claims 1 to 6, wherein the gas phase purification step comprises performing high temperature heat treatment in the temperature range of from 800 to 1300 °C in a gaseous

atmosphere containing Cl.

8. A method for producing a quartz glass jig as claimed in Claim 7, wherein the gas containing Cl is HCl and/or Cl₂.

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9. A method for producing a quartz glass jig as claimed in one of Claims 5 to 8, wherein the gas atmosphere containing F further includes a gas containing H.

10. 10. A quartz glass jig produced by a method for producing quartz glass jigs as claimed in one of claims 1 to 9, wherein the quartz glass raw material is naturally occurring quartz glass containing Li, Na, Mg, K, Fe, Cr, Ni, and Cu within a range from surface to a depth of 100 µm, each at concentrations less than 50 ppb.

11. 15. A synthetic quartz glass jig produced by a method for producing quartz glass jig as claimed in one of Claims 1 to 9, wherein the quartz glass raw material is synthetic quartz glass, which contains Li, Na, Mg, Al, K, Ca, Ti, Cr, Fe, Ni, and Cu within a range from surface to a depth of 100 µm, each at concentrations less than 50 ppb.